

Shallow Trench Isolation Process Flow

1. Pad Oxide
2. Nitride: trench etch hard mask and CMP stop layer
3. Island mask
4. Trench etch
5. Oxide liner: corner rounding
6. Trench fill
7. Densification (can be skipped)

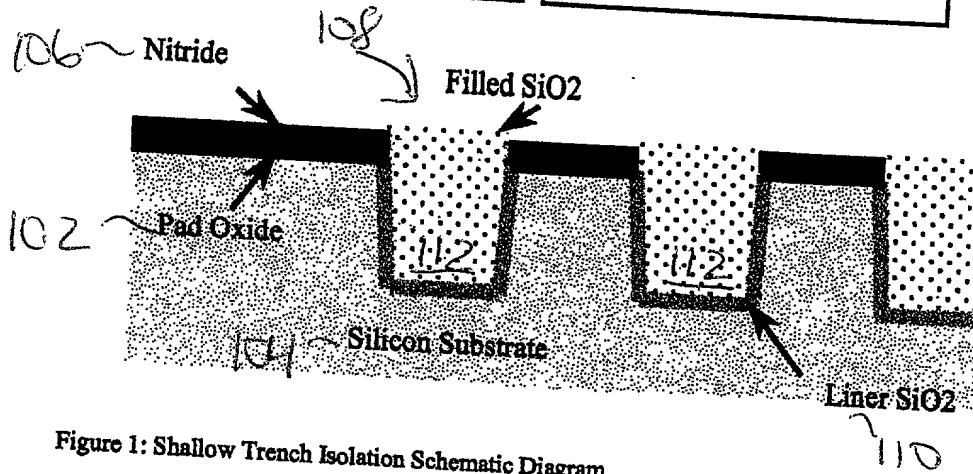
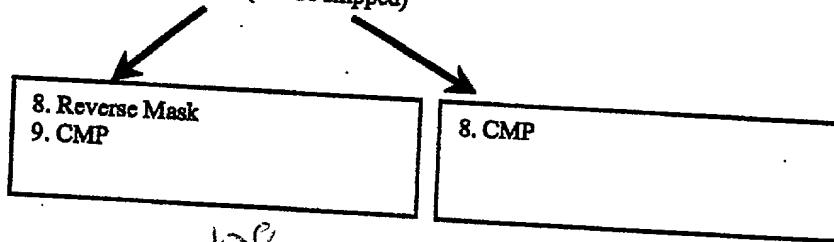


Figure 1: Shallow Trench Isolation Schematic Diagram.

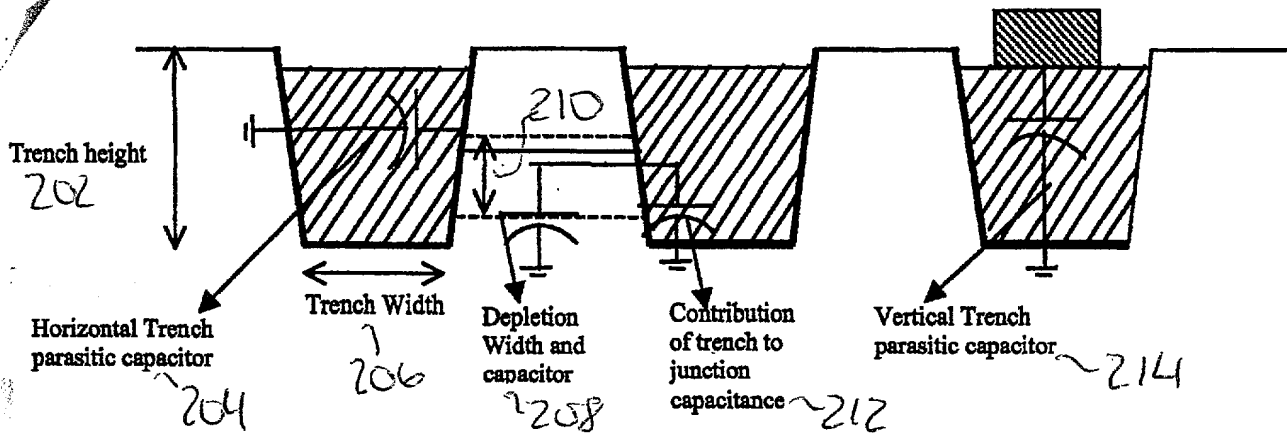


Figure 2: The different components of capacitance associated with the trench isolation dielectric.

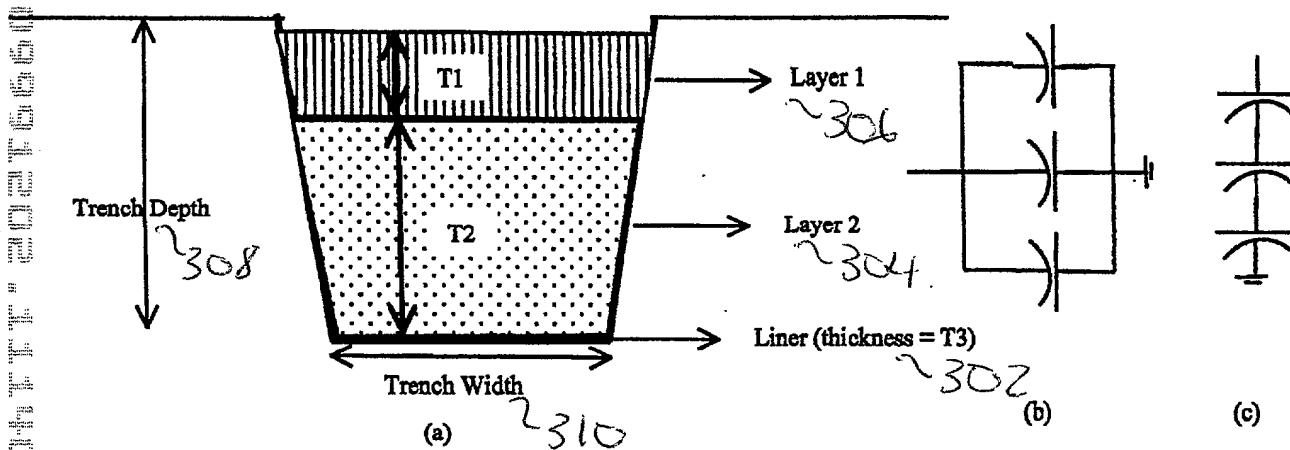
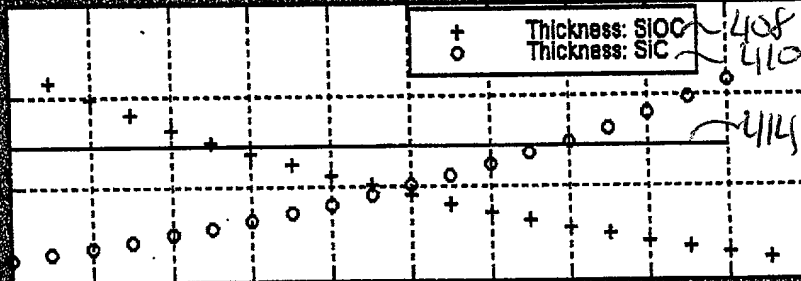
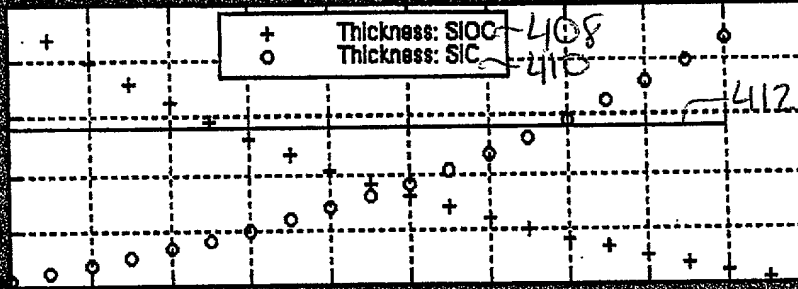


Figure 3: (a) The new trench isolation scheme using multiple trench fill materials, (b) the capacitance from the trench as seen by two adjacent islands, and (c), the capacitance seen in the vertical dimension.

~404
Total Capacitance Effective k

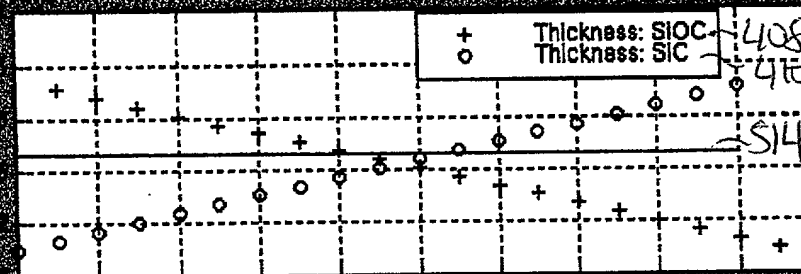
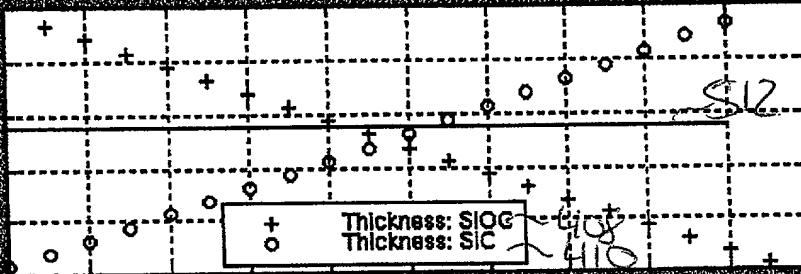


~402
Layer thickness

~402
Layer thickness

Figure 4: Effective dielectric constant and capacitance of the vertical parasitic trench capacitor with varying thickness of the two component layers.

~504
Total Capacitance Effective k



~502
Layer thickness

~502
Layer thickness

Figure 5: Effective dielectric constant and capacitance of the horizontal parasitic trench capacitor with varying thickness of the two component layers.